NuclearSafety
Associates

Reliability Assessment
of the Vermont Yankee Nuclear Facility

Provided by Nuclear Safety Associates

to the

State of Vermont Department of Public Service

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REDACTED PUBLIC VERSION

EXHIBIT 4

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Executive Summary

Entergy Nuclear Vermont Yankee (ENVY) provides about one-third of the energy for the State of Vermont. Since 2002, ENVY has increased its plant capacity from 1563 Mwt to 1912 Mwt. ENVY, on January 27, 2006, applied to the NRC for a 20-year extension of its operating license. Historically, ENVY has been a reliable source of power for Vermont. However, in recent years the station has experienced several operational events which have raised concerns about the reliability of the station.

The State of Vermont General Assembly passed Legislative Act 189 (S.364) which called for an independent assessment of the ENVY station's current and future reliability. Subsequently, during the period of August 13 through December 16, 2008, a team of nuclear professionals with exceptionally deep and diverse nuclear experiences from Nuclear Safety Associates (NSA) conducted an assessment of Entergy's Vermont Yankee nuclear power station. This assessment was conducted in accordance with the requirements of Legislative Act 189 (S.364) and the scope of work was approved by the State of Vermont Department of Public Service in consultation with the Public Oversight panel.

Act 189 called for a thorough, independent, and public assessment of the reliability of the systems, structures, and components of the ENVY facility and of its management and organizational effectiveness to examine the reliability of the nuclear station. Further details on the purpose, goals and the assessment process are included in the Introduction Section of this report.

As part of this assessment, NSA team members conducted reviews and assessed ENVY performance in comparison with NSA experiences and expectations for high performing nuclear plants. The criteria were applied to the evaluation of ENVY's systems, structures, components, station processes, and management and organizational effectiveness. Overall assessment of performance to these criteria was based on the collective professional judgment of the NSA team members, taking into account a range of qualitative and quantitative factors.

Overall and Principal Conclusions

The overall and principal conclusions are those high level, over-arching or cross-cutting issues that potentially support or challenge reliable operation of ENVY. Assessment findings of a minor nature, or limited to one area, are contained within the respective sections in the body of the Reliability Assessment Report.

Overall Conclusion

ENVY is operated reliably.

Entergy, the 2nd largest nuclear power generating company in the US, purchased the Vermont Yankee Nuclear Power Station in 2002. Following purchase of the station, Entergy made significant investments to improve the reliability of the station. NSA noted that station personnel were effectively trained and qualified to industry standards. Under Entergy direction, ENVY is moving to a

fleet standard organization with consistent procedures and standards. Overall, many station managerial and technical areas meet or exceed industry standards for performance. The station is operated and maintained in a reliable manner.

In addition, ENVY can be a reliable station beyond its current operating license, provided that the areas identified in the following principal conclusions are effectively addressed. Management action, oversight and follow-through are needed to ensure that these issues are addressed and resolved if ENVY is to improve its performance to top industry levels.

Principal Conclusions

The following issues are, or may be, watch areas or challenges to plant reliability.

1. Procedure quality issues

NSA review of procedures determined that, while procedures were technically correct, the current formatting did not readily support Human Performance (HU) tool usage, such as place keeping and data collection on each page. The formatting also was not up to current industry standards relative to linkage to other procedures. The existing format also lacks specific guidance at times, with 'if desired; when necessary' statements, leaving it open to interpretation and judgment by workers. As a result, there have been plant events related to procedure quality or procedure use and adherence.

Previously, ENVY had a stable workforce. However, in recent times there has been an influx of new employees, especially in the Operations Department and the Maintenance Department Electrical and Instrument and Controls sections. These newer individuals will be more dependent upon detailed procedure guidance.

In recognition of these procedure shortcomings, ENVY recently developed an action plan to improve station procedures. The plan is currently focused on developing a process to identify which procedures to upgrade on a priority basis; considering: condition reports, frequency of use, complexity, significance and other criteria. The General Manager Plant Operations stated that he intends that this new plan will supersede the procedure efforts that were previously ongoing in the Maintenance Department.

Once the full scope of procedure upgrades is identified, a detailed schedule will need to be developed to determine which procedures will be completed in order of priority. A detailed change management plan should also be developed to help manage the overall process and ensure its completion, especially in light of previous procedure projects being aborted. In recognition of the need for better procedures and the potential costs and complexity of this project, this is considered a challenge to future reliability.

wide directive called EN-DC-320 Identification and Processing of Obsolete Items (draft at the time of this evaluation). The assessment efforts were not able to identify the change management plan for the implementation of this procedure.

The full implementation of the long-term asset management program is important to the long-term reliability of plant equipment and components and should remain a focus area for ENVY.

Aging Management Programs

ENVY's application for a license extension was submitted to the NRC on January 27, 2006. The application included a list of those safety-related structures, systems, and components subject to aging management reviews. The application was based on USNRC NUREG-1801, Volume 2, Revision 1, 'Generic Aging Lessons Learned (GALL) Report', dated September of 2005. The GALL Report contains the NRC's generic evaluation of existing plant aging management processes and documents the technical basis for determining where existing aging management programs are adequate without modification, and where existing programs should be augmented for extended operation.

As part of its application to the NRC for license renewal, ENVY committed to implement a comprehensive Aging Management Program, consistent with the GALL Report, by 2012. The details of the program are contained in the Vermont Yankee Nuclear Power Station License Renewal Application. For structures, systems, and components subject to aging management reviews, the application identified the materials, the environment the materials are exposed to, the aging effect the environment has on the materials, and the applicable Aging Management Programs, both existing and augmented, credited with managing and monitoring the aging effects. Each program includes preventive actions, parameters to be monitored, detection mechanisms of aging effects, monitoring and trending methodologies, acceptance criteria, corrective actions, confirmation processes, administrative controls, and associated operating experiences.

The NRC conducted a comprehensive audit of ENVY's License Renewal Application, including the Aging Management Programs, and issued its Safety Evaluation Report in March of 2007.

Interviews with plant personnel determined that they were familiar with the Aging Management Program commitments in general but not the program specifics. This is consistent with industry practices for future commitments.

ENVY recognizes the need to initiate an implementation plan, including appropriate training, so that all the elements of the Aging Management Program will be in place by the committed date of 2012. It is recommended that the existing Aging Management Programs credited in the application, be identified as such in order to ensure their integrity between now and 2012.

As part of the commitment to the NRC requirement for life extension, a draft Project Plan "ENVY License Renewal Commitments" identified 39 Long Range programs that will be required in support of the license renewal for implementation by 2012. The programs are listed below in Tables 2, 3, and 4, including the current overall status as indicated by ENVY.

Table 2: Programs Not Requiring Enhancement

17 Programs In Place Not Requiring Enhancement	
• BWR CRD Return Line Nozzle program • BWR Penetrations program • BWR Vessel ID Attachment Welds program • Containment Leak Rate program • Flow Accelerated Corrosion • Instrument Air program • Masonry Wall program • Water Chemistry Control- BWR Program	• BWR Feedwater Nozzle Program • BWR Stress Corrosion Cracking • Containment In-service Inspection Program • Environmental Qualification • In-service Inspection • Oil Analysis program • Reactor head Closure Studs program • Water Chemistry Control-Closed Cooling Water Chemistry • Vernon Hydroelectric Station

Table 3: Programs Requiring Enhancement

13 Programs Requiring Enhancement	
• Diesel Fuel Monitoring • Fire protection • Buried Piping • Reactor Vessel Surveillance • Structures Monitoring • System Walk-down	• Water Chemistry Control-Aux Systems • Bolting Integrity • Fatigue Monitoring • Service Water Integrity • BWR Vessel Internals • Fire Water System • Periodic Surveillance And Preventive Maintenance

Table 4: Programs Required

9 Programs Required	
• Heat exchanger program • Metal Enclosed Bused Inspection • Thermal Aging and Neutron Irradiation Embrittlement of Caustic Austenitic Stainless Steel (CASS) • Electrical Connections One –Time Inspection	• Non—EQ Insulated cables one time Inspection • Selective Leaching • Non-EQ Inaccessible Medium-Voltage cable • Non-EQ Instrumentation Circuits Tests Review • Bolted Cable Connections

The current Long Range Asset Management process is not yet fully developed. However, recognizing that the forthcoming decision regarding license renewal is a significant decision facing the continued operation of ENVY, the need going forward will be to establish a more comprehensive/integrated asset management and long range planning program.

Equipment Reliability Process Performance

At ENVY the current industry standard ER Index was reviewed and compared to the overall US Nuclear industry (91 units), the Entergy fleet (12 units) and a group of 'Sister Plants' selected by the State of Vermont. A benchmark study was performed as part of this initiative (refer to Section 1.4 of this report) that provides ER performance comparison data. START CONFIDENTIAL INFORMATION

END CONFIDENTIAL INFORMATION

Analysis of all ER Index data included is included in the benchmark data report (in Section 1.4).

Conclusions

Engineering's staffing for each of the design, systems, and components/programs departments is a watch area due to the fact that attracting and retaining qualified, experienced personnel has been challenging at ENVY. Retirements and attrition over the next five years could impact the organization's effectiveness if not properly managed.

In Engineering at ENVY, all groups are now aligned with the Entergy fleet standardization model. In the design group, the procedures reviewed were fleet-wide procedures. Likewise, communication within the department is good and the exchange of information with other Entergy plants is good.

The overall Design Engineering group's performance is in line with industry good practices. There are occasional performance deficiencies, but the number and significance of those deficiencies are also consistent with industry standards and do not represent a pattern of performance deficiencies. The processes and procedures implemented by the design engineering group to manage modifications, margin, and configuration management are consistent with industry standards. The application of these procedures as evaluated in the system vertical slice reviews were applied adequately to ensure plant equipment/components are designed and installed to ensure plant reliability.

In the Equipment Reliability area, the standardization of processes with the Entergy fleet is progressing slowly.

- In addition, the overall ER Index performance should be a focus area for ENVY. START CONFIDENTIAL INFORMATION